NATIONAL DHIA

National Dairy Herd Information Association

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Got Genomic Testing?

Genomic Testing is a Management Tool for all Dairy Herds

In 2010 genomic testing in dairy production was introduced as a tool for testing or screening males that would be entering artificial insemination (AI) and a few high-end females for merchandising or bull mothers. 50 K SNP chip technology was the genotyping platform available at a fee in the $250 plus dollar range per genomic test. The mix of these genomic tests was about 60% male and 40% female. New technology in lower density 3 and 6 K SNP chips and computing strategies led to genomic testing fees in the $40 to $50 range. This created a pricing grid and return on investment (ROI) that opened new avenues and information for genetic and management uses of genomics.

In March of 2014, the industry cooperator database at the Council on Dairy Cattle Breeding (CDCB) surpassed the 500,000 mark of genotyped male and female animals. Genomic testing is being used by more and more dairy operations for merchandizing and management of genetic levels of herd replacements. Table 1 shows the three months from July 2104 to September 2014 for male and female genotyping submitted to the CDCB industry cooperator database. The increasing trend of more females being genotyped and getting genomic values has occurred since the start of more wide spread genomic testing in 2010. This trend is related to more genomic testing in commercial dairy cattle populations than was anticipated when genomic testing was launched in the late 2000's. Why are commercial dairies considering and using genomic testing? Genomic testing is part of a plan to help a dairy producer implement data into management decisions on a continuing basis.

Commercial Dairy Heifer Opportunities

Jeff Ziegler, genomics program manager at Select Sires Inc said in 2012, "Genomic insights create opportunities for commercial dairies to have more control over the profit potential of their future herd." Further research by the University of Florida has documented that culling the bottom 20 to 25 percent of genomic-tested heifers can yield a hefty ROI, especially when using sexed semen and having a potential surplus of replacement heifers.

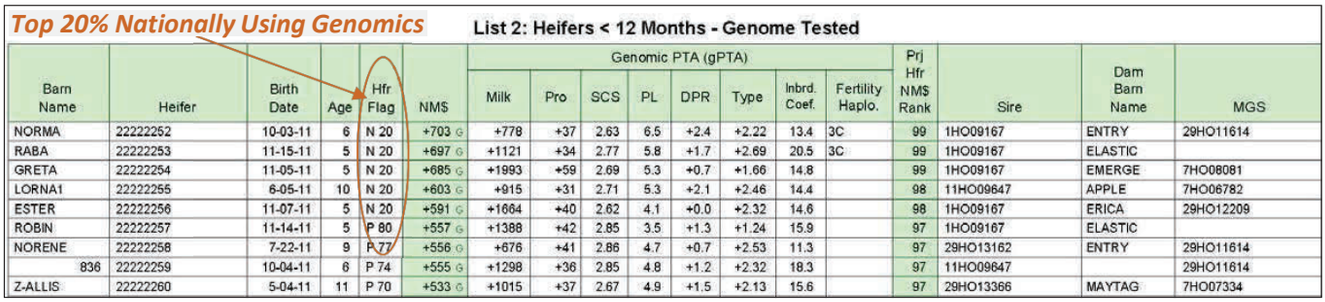
Feeding too many or the "wrong" heifers increases replacement costs when considering costs in a range of $2.25 to $2.50 per heifer per day. So genomic testing, and probably the earlier the better, to identify which heifers to raise is a benefit and increases the ROI from the genomic test cost. There are many ways to get the genomic information ranging from lists provided by dairy record processing centers [DHI-428 graphic close by], genomic reports from breed associations, plus genetic and pharmaceutical companies as part of their technical services.

Reliability and Accuracy of Predictions – The right herd replacements

There is debate amongst university extension staff and researchers about the magni-

Genotyping for July to September 2014

	Males genotyped (all breeds)	%age of genotyped	Females genotyped (all breeds)	%age of genotyped
July 2014	2,184	11.7%	16,484	88.3%
August 2014	2,595	12.1%	18,884	87.9%
September 2014	2,126	9.2%	20,948	90.8%



Barn Name	Heifer	Birth Date	Age	Hfr Flag	NM$	Genomic PTA (gPTA)								Prj Hfr NM$ Rank	Sire	Dam Barn Name	MGS
						Milk	Pro	SCS	PL	DPR	Type	Inbrd. Coef.	Fertility Haplo.				
NORMA	22222252	10-03-11	6	N 20	+703 G	+778	+37	2.63	6.5	+2.4	+2.22	13.4	3C	99	1HO09167	ENTRY	29HO11614
RABA	22222253	11-15-11	5	N 20	+697 G	+1121	+34	2.77	5.8	+1.7	+2.69	20.5	3C	99	1HO09167	ELASTIC	
GRETA	22222254	11-05-11	5	N 20	+685 G	+1993	+59	2.69	5.3	+0.7	+1.66	14.8		99	1HO09167	EMERGE	7HO08081
LORNA1	22222255	6-05-11	10	N 20	+603 G	+915	+31	2.71	5.3	+2.1	+2.46	14.4		98	11HO09647	APPLE	7HO06782
ESTER	22222256	11-07-11	5	N 20	+591 G	+1664	+40	2.62	4.1	+0.0	+2.32	14.6		98	1HO09167	ERICA	29HO12209
ROBIN	22222257	11-14-11	5	P 80	+557 G	+1388	+42	2.85	3.5	+1.3	+1.24	15.9		97	1HO09167	ELASTIC	
NORENE	22222258	7-22-11	9	P 77	+556 G	+676	+41	2.86	4.7	+0.7	+2.53	11.3		97	29HO13162	ENTRY	29HO11614
836	22222259	10-04-11	6	P 74	+555 G	+1298	+36	2.85	4.8	+1.2	+2.32	18.3		97	11HO09647		29HO11614
Z-ALLIS	22222260	5-04-11	11	P 70	+533 G	+1015	+37	2.67	4.9	+1.5	+2.13	15.6		97	29HO13366	MAYTAG	7HO07334

Source: Dairy Records Management Systems (DRMS) Report DHI-428

tude of difference between using the traditional Parent Average (PA) [50% of the sire's genetic value and 50% of the dam's genetic value] and the genomic predictions for heifer raising. The results in Table 2 of research by Paul VanRaden at USDA-AGIL show the increase in reliability when genomic information is included in genetic predictions as compared to reliability of parent average only.

What may be impacted is the accuracy with younger animals being genotyped, limited progeny testing and less phenotypic data being used to account for management and environment effects on the genetic expression. So the reliability of genomic values is higher but the accuracy maybe the same or less. Overall genetic progress will be greater because of using younger animals and reducing the generation interv al.

Another Benefit – Identification

Good and accurate animal identification is a challenge at every dairy operation. Animal misidentification can create a large amount of error handling and possibly keeping or culling the wrong animal. Genomic testing provides the opportunity to verify or discover the correct parentage of the animal. Better animal identification also allows for managing inbreeding and avoiding genetic recessives in the breeding program. The value of identification allows management of cattle from birth to the milking herd and ultimately herd culling.

Managing through Genomics

Many dairy farmers using genomic testing early in an animal's life have determined that managing their herd inventory with optimal genetic levels allows more confidence in their decision making and results. This confidence is hard to put an exact dollar value on, but allows the opportunity for management using the genomic tool box.

Genomics has the potential for all dairy producers but especially commercial producers to screen calves and heifers for producing ability in comparison to the current herd levels. Over time the herd genetic and production levels would be higher by raising calves or heifers above a certain genetic level. Simply managing the dairy herd's genetics through genomic testing will provide an ROI that will have an impact on the overall production and financial results of the herd.

Reliability changes due to the inclusion of genomic data in national genetic evaluations (VanRaden et al., 2009)

Trait	Increase in Reliability Due to Genomics		
	Holstein	Jersey	Brown Swiss
	%		
Net merit	+24	+8	+9
Milk yield	+26	+6	+17
Fat yield	+32	+11	+10
Protein yield	+24	+2	+14
Fat percentage	+50	+36	+8
Protein percentage	+38	+29	+10
Productive life	+32	+7	+12
Somatic cell score	+23	+3	+17
Daughter pregnancy rate	+28	+7	+18
Final classification score	+20	+2	+5
Udder depth	+37	+20	+8
Foot angle	+25	+11	-1